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- Arts Educators' email newsletter
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The newsletters contain information that has deadlines that are too short to make the State of the Arts. If you'd like to sign-up for one or more of these, please offer us your contact information and what you'd like to receive at: art.mt.gov/resources/resources_soasubscribe.asp or send us an email at: mac@mt.gov.

Mad science and the arts: Making the case for STEAM

By Jonathan Katz
CEO, National Assembly of State
Arts Agencies
From *NASAA Notes*, December 2013

I'm reading a book misleadingly entitled *Mad Science*. It's about what its subtitle mentions – *Einstein's Fridge, Dewar's Flask, Mach's Speed, and 362 other Inventions and Discoveries That Made Our World* – and its content comes largely from *Wired*.

Example after example illustrates how inventors and creative thinkers draw upon their artistic and design skills as they break ground or add value in science, mathematics, engineering and technology. For instance, there is good historical evidence that Newton spoke to several contemporaries about his law of universal gravitation, deriving from his direct observation of an apple falling and wondering why it went constantly to the earth's center rather than in any other direction.

Think about it. People had been watching objects fall for millennia, but they saw the objects stop at the earth's surface; Newton's innovation was visualizing an object create a line to the center of the earth.

In another example, a North Carolina trucking company owner named Malcom McLean had the insight in 1956 that shipping whole truck trailers would be more efficient than transporting various cargo containers. His innovation included designing the system for separating truck bodies from their bed and wheels, and visualizing the system for stacking them supported by angle-cornered posts.

According to *Mad Science*, containerized shipping now accounts for 90% of global cargo, and the average cost of overseas transportation has been reduced from 15% of retail price to 1%.

Close observation, which has been understood as the first step in modern scientific method since Francis Bacon first described it in 1620, is not only visual. Artistic skills include hearing, touching, moving, smelling, tasting; it's useful to think of artistic skill as sensory awareness and exploration.

Some scientists and engineers make extraordinary contributions because they have ideas about what needs to be heard. Heinrich Stölzel, in 1814, is credited with inventing a system of valves for the French horn. Before this time, "natural" horns were used for signals and ceremonies, but it was a rare virtuoso who could play multiple notes. After valves, cornets, tubas and trumpets became widely played instruments.

In 1920, teenaged engineer Michael Lyons was retained by the *Detroit News* to expand its programming through radio. He played 10 days of music to test the channel's capacity and then, with government permission, covered an election on radio for the first time ever. The paper reported, "The news of the world was being given forth through this invisible trumpet to the waiting crowds in the unseen market place."

Mad Science relates that in 1849 an inventor named Walter Hunt, to pay off a debt, took

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– **Jonathan Katz**



a single eight-inch piece of brass wire, coiled it, applied a clasp, and sold the rights to his "dress pin" for today's equivalent of \$11,000. Where can you find an authentic 1849 Hunt safety pin? Rightfully, in New York's Museum of Modern Art.

Hunt is a fascinating character. He also invented "Antipodean Performer" suction shoes for circus acts walking on walls and ceilings, and is credited with building America's first sewing machine before either Howe or Singer.

I've checked out several compendia of "greatest inventions" and "innovations that changed the world" recently and have found some compelling themes. The breakthroughs come through an integrated mix of the three basic symbol systems that learners draw upon to understand and explore everything – numeracy, literacy and imagery (where imagery includes sensory impressions, not only visual). A consistent sequence, though, for invention, is imagery, numeracy, literacy.

Consider Newton's theory of universal gravitation and McLean's containerized shipping system.

It made perfect sense to the founders, as they defined the roles of Congress in Article 1, Section 8, of the U.S. Constitution, to enable the federal government "to promote the progress of science and useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries." Thus, they provided protection to the products resulting from innovation drawing upon all of the symbol systems.

It is good to see that the work of the congressional STEAM (science, technology, engineering, arts, mathematics) Caucus is gaining momentum and that its co-chairs, Congresswoman Suzanne Bonamici (D-OR) and Congressman Aaron Schock (R-IL), reflect bipartisan leadership. The group's aim to integrate arts and design with STEM education efforts is a laudable goal. NASAA will monitor and participate in the activities of the STEAM Caucus and inform state arts agencies when and where their own participation can be most beneficial.

Meanwhile, it's useful to consider why the arts and design, which are so obviously integral to scientific, technological, engineering and mathematical achievement, and have been viewed so historically, are considered adjuncts to STEM education in the first place.

Clearly, artists and arts advocates have not persuasively made the case – however strong the evidence may be – that the skills and understandings of imagery are just as important as the skills involved in using words and numbers.

We have not clearly enough linked arts learning with the design and problem-solving skills applied in video gaming and website production, and the broad fields of architecture, product development and 3-D printing, environmental and urban planning, and the communication of complex information.

We have not clearly enough communicated the unique contributions to imagination, creativity and innovation that arts learning and arts making provide. We have not successfully implemented the programs and communication strategy capable of overcoming the negative or neutral connotations that many people bring to the word art.

Indeed, some of our agencies are quite effectively using other words to convey the benefits that the arts and cultural activities provide. One way or another, we have made enormous progress in recent years developing programs and communication that make explicit the benefits of the arts and cultural activities in economic development, in job creation, in creative place making and cultural district development, in cultural tourism, in creative aging, and in youth programs as well.

The arts are increasingly integrated in all these dimensions of community development. But we have not sufficiently linked these public benefits with the full integration of arts learning in our school, district and state education policies.

As we design our public planning processes; align our mission, goals and program activities; and enhance our relationships with constituents through social media, it will be useful to keep in mind the need to communicate more effectively how essential arts learning is to the achievement of every educational goal.

STATE OF THE ARTS

State of the Arts is published six times a year by the Montana Arts Council and produced by *Lively Times*.

State of the Arts welcomes submissions of photographs, press releases and newsworthy information from individual artists and arts organizations.

Please check with the Montana Arts Council for reprint permission.

Deadline: The deadline for submissions is January 25, 2014, for the March/April 2014 issue. Send items to: Montana Arts Council, PO Box 202201, Helena, MT 59620-2201; phone 406-444-6430, fax 406-444-6548 or email mac@mt.gov.

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Call for Cultural and Aesthetics Project Advisory Committee: Deadline May 1

Applications for membership on the Cultural and Aesthetic Project Advisory Committee will be accepted through May 1, 2014. The Montana Arts Council makes half of the appointments to this committee, and the Montana Historical Society makes the other half.

The arts council looks for a broad range of professional arts expertise, and also geographic, racial and gender balance for the committee. Obligations of the four-year terms include attending a two-day panel meeting every other year and reviewing up to 100 grant applications online in preparation for that. The next meeting is scheduled for Oct. 13-14, 2014 in Helena.

If you are interested in being considered, please send a letter of interest and a resume or bio electronically to Kristin Han Burgoyne at kborgoyne@mt.gov by May 1, 2014.